

Appl. No. 09/876,290  
Amtd. Dated August 23, 2005  
Reply to Office Action of March 23, 2005

**AMENDMENTS TO THE DRAWINGS:**

The attached sheet of drawings include changes to Fig. 2(d).

The sheet which includes Fig. 2(d) replaces the original sheet including Figs. 2(a)-2(f). The lead line extensions requested by the Examiner have been added.

The attached sheet of drawings also include changes to Fig. 2(f), 5(a), and 5(b).

The sheet which includes Fig. 2(f) replaces the original sheet including Figs. 2(a)-2(f). The sheet which includes Figs. 5(a) and 5(b) replaces the original sheet including Figs. 5(a0, 5(b), and 6. The lead lines requested by the Examiner have been added.

Attachment: Replacement Sheets

Annotated Sheets Showing Changes in Red

**REMARKS**

In regard to the Examiners objections to the drawings under 37 CFR 1.84(p), Applicants submit that 1.84(p) is directed to the use of **brackets** (plural) to surround a reference character, which is normally used to signify the removal or cancellation of an object or text. Applicant's use of a **bracket** (singular) is in order to illustrate "the relationship or order of assembly of various parts," which is the policy illustrated, for example, in 37 CFR 1.84(h)(1). Accordingly, Applicants submit that their figures are in full compliance with 37 CFR 1.84.

In regard to the Examiners objections to the drawings under 37 CFR 1.84(p)(4), Applicants submit that the drawings fully conform with that Section. Namely, the same part of the invention (2) appearing in more than one view of the drawings must always be designated by the same reference character. As taught at the bottom of page 11 of Applicant's specification, reference numeral 2 refers to a generic "semiconductor module 2." All of the references in the drawings of which reference numeral 2 points to could be classified as a "semiconductor module." The plan view in Figure 5(b) shows an upper or lower most semiconductor module 2. Because this is a top view, the reference numeral 2 corresponds to the top semiconductor module 2d when the cover 34 is removed. Accordingly, Applicants submit that their figures are in full compliance with 37 CFR 1.84.

In regard to the Examiners objections to the drawings under 37 CFR 1.84(q), Applicants have added the request lead lines for references 1 and 30.

Fig. 2(d) has been amended to comport with the Examiner's objection under 37 CFR 1.84.

Applicants respectfully request reconsideration of Examiner's objection to the Drawings under 37 CFR 1.83(a). In regard to claim 6, Applicants note that the use of a positioning hole in the mother substrate is illustrated in Figure 4. Accordingly, one of ordinary skill in the art, in view Figure 4 and the disclosure at the first full paragraph of page 21, would have known that the mother substrate must be provided with another hole formed aligned with the positioning pins claimed in dependent claim 5. As stated in 37 CFR 1.81, the applicant is only required to furnish drawings of his or her invention where necessary for the understanding of the subject matter sought to be patented. Applicants submit that the current drawings and specification together more than adequately describe the subject matter of claim 6 in order to allow one of ordinary skill in the art to build the device.

In regard to claim 12, support for this claim can be found starting at the top of page 20 of Applicant's disclosure, and in Fig. 5(b), which shows positioning pins 32 arranged adjacent to and in contact with sides of the stacked semiconductor modules 2.

In regard to claim 13, support for this claim can be found starting at the bottom of page 21 of Applicant's disclosure, and in Fig. 6, which shows positioning pins 41 extending through the semiconductor modules 2.

In light of the foregoing, Applicants respectfully request Examiner also withdraw his rejection of these claims under 35 U.S.C. §112.

If the Examiner still believes that there is an outstanding unresolved issue in regard to the drawings, then the undersigned respectfully request that the Examiner conduct a telephone interview.

In regard to Examiner's rejection of claims 2 and 3 under 35 U.S.C. §112 as being indefinite due to the term "box-shaped," Applicants submit that such a term is well known, and is clearly described in the specification. Additionally, Applicants have attached to this response a copy of the dictionary definition for "box." *The American Heritage® Dictionary of the English Language, Fourth Edition*, 2000. Entries 1(a) and 2 are clearly what Applicant's envisioned when drafting these claims. Furthermore, as taught in the 2<sup>nd</sup> full paragraph on page 15 of Applicant's disclosure, and in Figures 2(d) and 3, boxed-shape requires a structure having four sides and a base, wherein the four sides making up the body 15 are positioned perpendicular to the base 14, as shown in the respective figures. Accordingly, Applicants respectfully request Examiner withdraw the rejection of claims 2 and 3 under 35 U.S.C. §112.

Applicants respectfully request reconsideration of Examiner's rejection of claims 1 – 7 and 11 – 13 under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements. More specifically, Applicant's have claimed a multilayer semiconductor device assembly jig comprising a lateral position restriction mechanism (for example, 32 in Fig. 5a), a height restriction mechanism (for example, 34 in Fig. 5a), and a mother substrate alignment mechanism (for example, 22 in Fig.

4). If the Examiner wishes to maintain the rejection, Applicants respectfully request Examiner point to where exactly in Applicant's disclosure additional necessary structural connections are described. Applicants submit that claims 1 – 7 and 11 – 13 are supported by the specification, and respectfully request Examiner withdraw the rejection under 35 U.S.C. §112.

Applicants respectfully request reconsideration of Examiner's rejection of Claims 1 – 7 and 11-13 under 35 U.S.C. §102 as being unpatentable over Levy (U.S. Patent No. 5,869,353). Levy is directed to the apparatus of a multi-chip module such that **integrated circuit packages (ICs)** with output leads extending from opposing **side** surfaces can fit within a pre-defined aperture of a panel and can be bonded together at edges **indirectly** to an IC above or below it. (See, for example, Column 4, lines 40 – 43 which teach that the conductive pads 26 of a first frame are bonded to conductive pads 26 of a second frame, thereby indirectly connecting output leads of the ICs). Applicants assert this method and device to be entirely distinct from Applicant's currently claimed invention.

For example, Levy discloses a collection 12 of frames 22 to be used in the positioning of semiconductor IC's into pre-defined panel apertures to create a vertically aligned chip package stack. Applicant's invention, however, discloses the use of an assembly jig 3 in the creation of a multi-layered semiconductor device including multiple layers of printed wiring boards and semiconductor ICs aligned to interface to a target mother substrate. Further, Levy discloses that connections between IC layers be done solely via soldering of the pads 26 on the outside perimeter of the ICs (See Figures 5 and 6). Applicant's invention, however,

discloses connections between layers be done via solder bumps 13, and lands 8, 9 positioned between **top and bottom surfaces** of the respective printed wiring boards or ICs (See Figures 2 – 6).

To state it another way, Applicant's current invention is not in any way applicable to Levy, or vice versa, because 1) Levy does not use **printed wiring boards** between layers that are subject to warping during the reflow step, 2) Levy requires the dimensions of the semiconductor chips to be within the dimensions of the aperture opening, and therefore does not need to control the height of the overall device as one does with Applicant's multilayer semiconductor package, 3) Levy teaches the **indirect** soldering of ICs through the conductive pads 26 of frames 22, 4) Levy fails to teach or suggest the mounting of the jig to a mother substrate in which one of the semiconductor modules makes electrical contact with the mother substrate, and 5) Levy fails to teach or suggest the function of the jig to limit height and deformation during subsequent manufacturing processes.

Therefore, Levy provides no teaching or suggestion towards Applicant's currently claimed invention, which provides for an assembly jig to restrict the height of the resulting multi-layered semiconductor module to a consistent and repeatable value, and to suppress deformation due to warp of the layered printed circuit boards, wherein the device is comprised of a plurality of stacked semiconductor modules in which adjacent modules are electrically connected by solder connections between top and bottom surfaces thereof, a lateral position restriction mechanism for positioning and aligning each of the semiconductor modules, and a mother substrate alignment mechanism for aligning the jig with a mother

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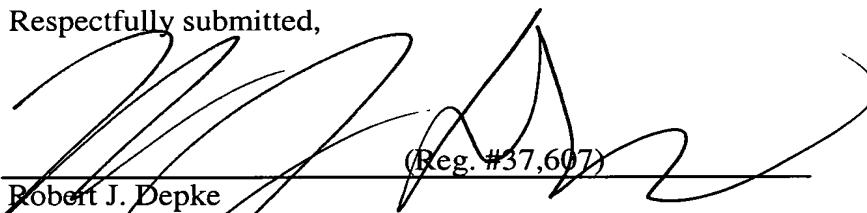
substrate on which the jig is to be mounted. As a result, Applicant's invention improves the yield and productivity in the creation of these multilayer semiconductor devices while incurring minimum additional costs.

Applicants have added new claims 16 – 21 that alternately define the invention solely for the purpose of advancing prosecution.

In conclusion, and based upon the above amendments and remarks, Applicants respectfully submit that all claims now stand in condition for allowance.

Date: 8/23/05

Respectfully submitted,

  
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## ASSEMBLY JIG AND MANUFACTURING METHOD OF MULTILAYER SEMICONDUCTOR DEVICE

AUG 23 2003

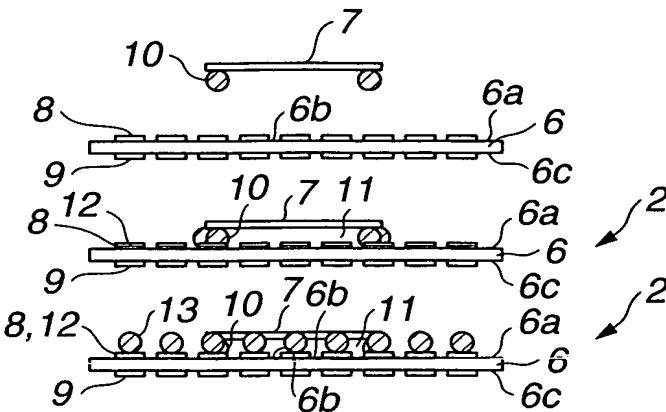
Inventor: Yoshiyuki Yanagisawa et al.

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Serial No. 05/078,290  
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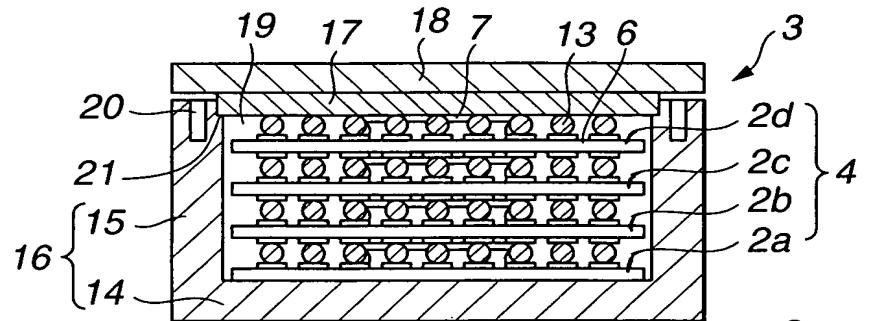
2 / 4

**FIG.2(a)**

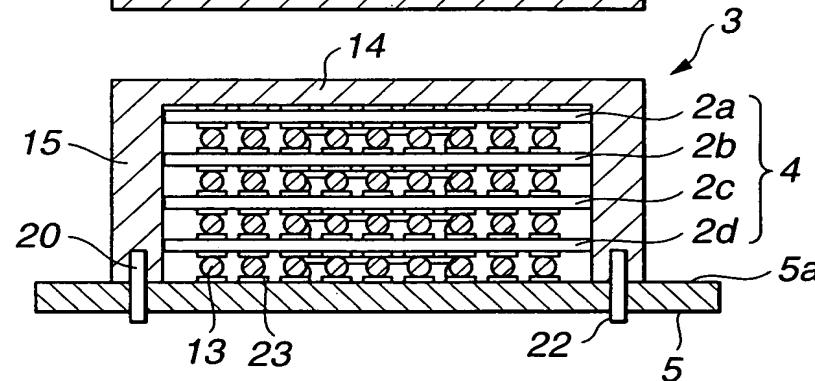


**FIG.2(b)**

**FIG.2(c)**



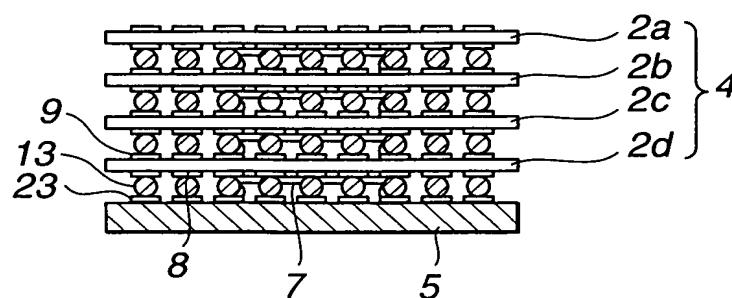
**FIG.2(d)**



**FIG.2(e)**



**FIG.2 (f)**



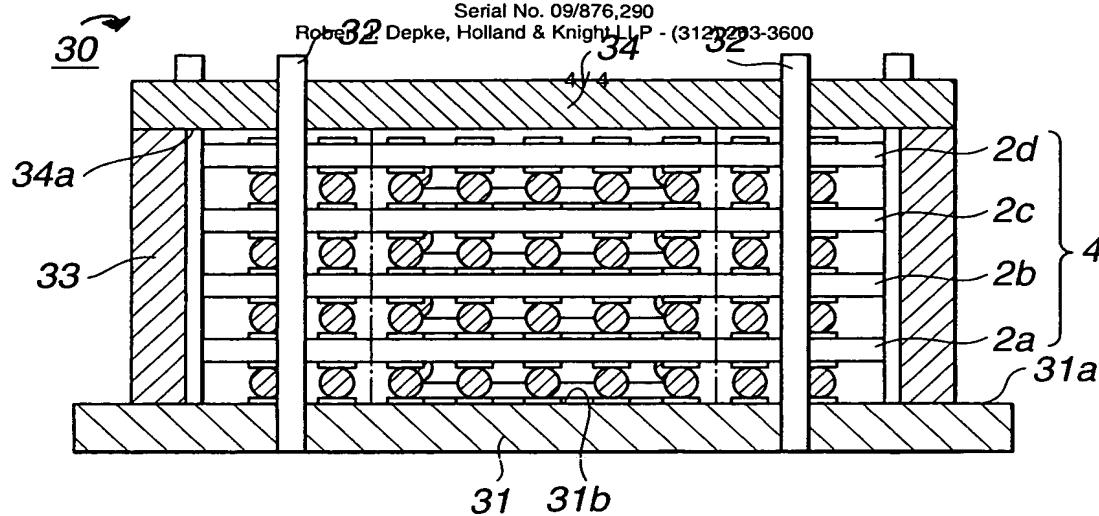


# ASSEMBLY JIG AND MANUFACTURING METHOD OF MULTILAYER SEMICONDUCTOR DEVICE

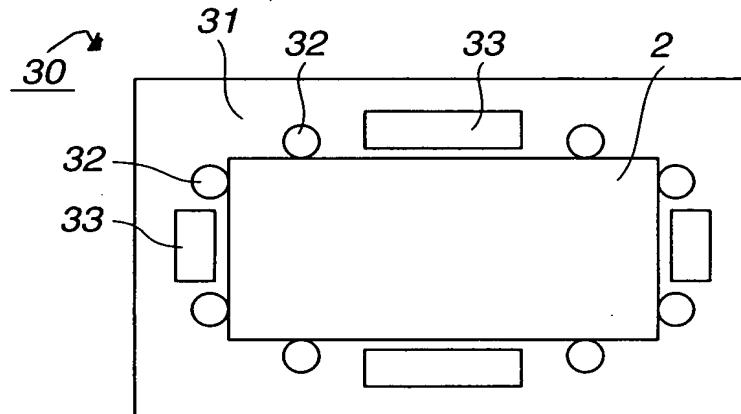
Inventor: Yoshiyuki Yanagisawa et al.

Serial No. 09/876,290

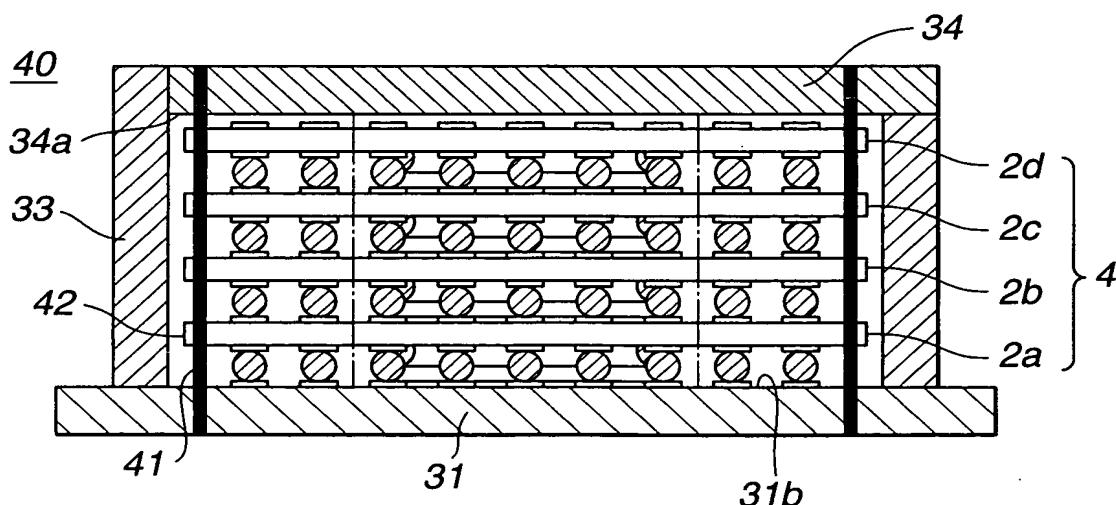
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## FIG.5(a)



## FIG.5(b)



## FIG.6

**box<sup>1</sup>**  **Pronunciation Key** (bōks)*n.*

1. a. A container typically constructed with four sides perpendicular to the base and often having a lid or cover.  
b. The amount or quantity that such a container can hold.
2. A square or rectangle: *Draw a box around your answer.*
3. a. A separated compartment in a public place of entertainment, such as a theater or stadium, for the accommodation of a small group.  
b. An area of a public place, such as a courtroom or stadium, marked off and restricted for use by persons performing a specific function: *a jury box.*
4. A small structure serving as a shelter: *a sentry box.*
5. *Chiefly British.* A small country house used as a sporting lodge: *a shooting box.*
6. A box stall.
7. The raised seat for the driver of a coach or carriage.
8. *Baseball.*
  - a. An area on a diamond marked by lines designating where the batter may stand.
  - b. Any of various designated areas for other team members, such as the pitcher, catcher, and coaches.
9. *Sports.* A penalty box.
10. *Printing.* Featured printed matter enclosed by hairlines, a border, or white space and placed within or between text columns.
11. A hollow made in the side of a tree for the collection of sap.
12. A post office box.
13. a. An in box.  
b. An out box.
14. a. An insulating, enclosing, or protective casing or part in a machine.  
b. A signaling device enclosed in a casing: *an alarm box.*
15. A cable box.
16. a. *Informal.* A television.  
b. A very large portable radio.
17. *Chiefly British.* A gift or gratuity, especially one given at Christmas.
18. An awkward or perplexing situation; a predicament.
19. *Vulgar Slang.* The vulva and the vagina.

**tr.v. boxed, box·ing, box·es**

1. To pack in a box.
2. To confine in or as if in a box.
3. To border or enclose with or as if with a box: *Key sections of the report are boxed off.*
4. To provide a housing or case for (a machine part, for example).
5.
  - a. To limit the activity or influence of by or as if by creating a restrictive structure or outlining a territory: *The legislature was boxed in by its earlier decisions.*
  - b. *Sports.* To block (a competitor or opponent) from advancing, especially to hinder an opponent from getting a rebound in basketball by placing oneself between the opponent and the basket: *was boxed out by the tallest player on the team;* *was boxed in on the homestretch.*
6. *Nautical.* To boxhaul.
7. To cut a hole in (a tree) for the collection of sap.
8. To blend (paint) by pouring alternately between two containers.
9. To change the shape of (a structure, such as a wall) by applying lath and plaster or boarding.

***Idioms:******box the compass***

1. To name the 32 points of the compass in proper order.
2. To make a complete revolution or reversal.

***in a box* Informal**

In a very difficult or restrictive situation.

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[Middle English, from Old English, from Late Latin *buxis*, from Greek *puxis*, from *puxos*, *box tree*.]

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Source: *The American Heritage® Dictionary of the English Language, Fourth Edition*

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